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TUNABLE FILTER REFURBISHMENT(U) LOCKHEED MISSILES AND
SPACE CO INC PALO ALTO CA PALO ALTO RESEARCH LAB
W J ROSENBERG 1981 LMSC-D444437 N00014-82-C-0081

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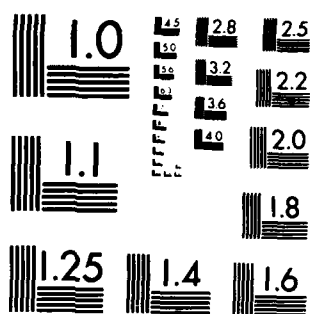
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Tunable Filter Reburishment
Contract N00014-82-C-0081
Final Report

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This project consisted of replacing quartz birefringent elements in a tunable filter at Lockheed Research Labs. The elements were borrowed from this filter in order to construct the 2 Å birefringent filter for the 1981 SLCAIR experiment. Four elements were taken from the Lockheed filter to act as a blocking section for the narrowband elements built specifically for the 1981 filter.

The elements are 3.0" diameter quartz elements, field widened with polyvinyl alcohol (PVA) laminated achromatic half wave plates. They have been made tunable with PVA achromatic quarter wave plates. The mechanical element holders used in the Lockheed tunable filter were not used in the 1981 filter so they did not have to be replaced.

For the replacement elements quartz crystals were purchased from Sawyer Research Products, Eastlake, Ohio. Two of their "Sandia" stones were required. Since Lockheed does not usually do its own quartz machining the crystals were sent to Kappler Crystal Optics for fabrication. Kappler Crystal Optics has a unique capability for grinding and polishing crystal quartz for wide-field birefringent filters. At Kappler the crystals were sliced, ground and polished into x-cut plates. The plates are 3.0" diameter and either 0.075" thick or 0.0188" thick.

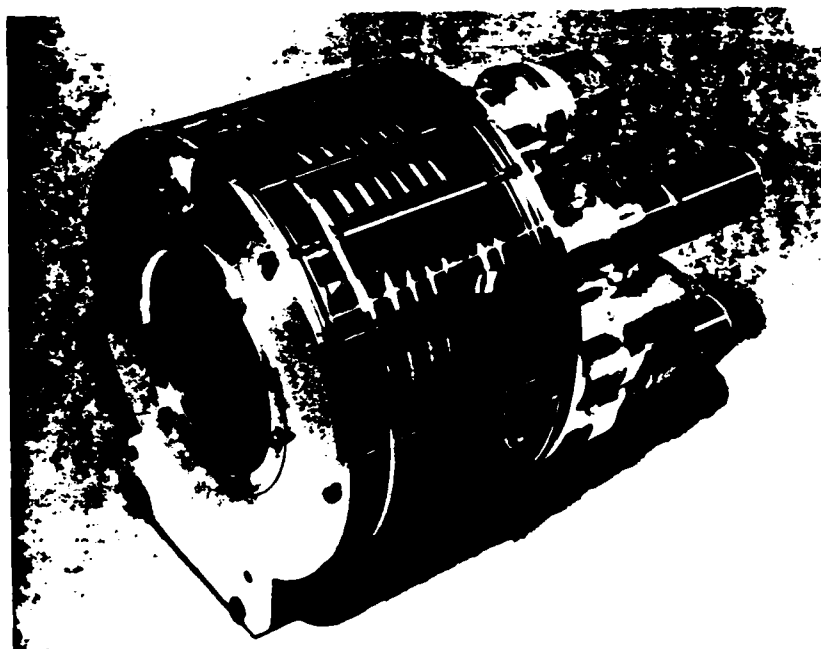
Achromatic waveplates for field widening and tuning are made from laminations of PVA retarder material. This plastic film was purchased from Polaroid Corporation, Norwood, Massachusetts. The PVA film is oriented and cemented between optical glass plates with UV curing Norland 61 optical cement. The glass plates are white crown glass purchased from Hoya Optics, Fremont, California.

Polarizers for these elements are also cemented in glass. They were made using Polaroid Corporation HN-38S sheet polarizer. In order to increase the transmission of the filter the polarizers were bleached in dilute NaOH before lamination.

Each finished wide-field element was assembled as a combination of polarizer, quartz, half wave plate, quartz, and quarter wave plate. While the four

elements have the same construction, they differ in their amounts of quartz. Each element has twice the thickness of quartz as its predecessor.

As mentioned previously, the elements are placed in element holders which had been machined earlier. These holders are geared to allow for filter tuning by element rotation. The final assembly is enclosed in an acrylic case with a motor for driving the tuning mechanism. The completed filter is shown in the figure below:



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